NETINT

Logan
Video Server

VPU | ASIC Video Processing Unit

Executive Summary

We created a new category of Smart VPUs (ASIC-based video processing units) to disrupt the previous limitations of video encoding for streaming delivery platforms. It is unique because it's dense, cost effective and AI-powered making it the ideal technology for platforms to future-proof their services and hyperscale profitably.

Designed as a quickstart solution for high density live video encoding, the Logan Video Server comprises ten T408 VPUs in a 1RU chassis that performs the equivalent work of up to 10 dedicated servers running a typical open-source FFmpeg and x264 or x265 configuration. The server delivers the lowest TCO of any solution in the market, and is a drop-in replacement for existing CPU and GPU encoding stacks.

The results are profound and transformational.

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Smart VPUs will be the engine powering all future video streaming experiences

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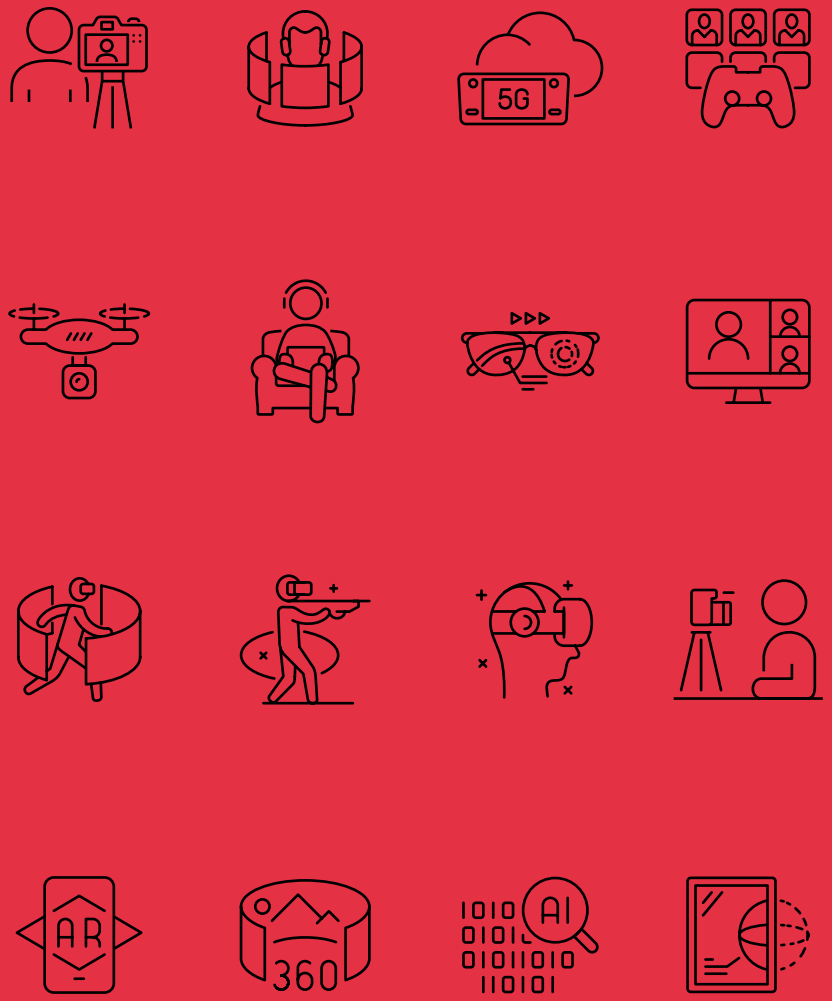
HYPERSCALE PROFITABLY

Live streaming experiences are seeing rapid adoption

Applications:

- Live events
- Interactive video
- Cloud gaming
- Real-Time video
- Virtual worlds
- 360 / VR / AR



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The insatiable appetite of video consumers

They want nonstop, never-ending, high-resolution, non-buffering content accessible on any device. Now.

Viewers have developed an addiction to continuous content streaming. Video delivery and entertainment experiences are shifting from file-based to live where low latency and controlling operational costs are paramount.

- Increased public cloud provider costs are stressing businesses
- Live experiences are growing in resolution, color depth, and quality expectations
- Playback is expected on every device using its full capability
- More data centers are needed to handle capacity increases

2021

Social video viewing surpassed Google search traffic

> 1 billion active montly users on short-form video apps.

65%

Percentage of ALL internet traffic is video streaming, increasing 24% year over year.

40%

Percentage of people 18 to 24 turning to visual-based social media platforms for internet searches.

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Why Smart VPUs are needed.

Density is a dirty expensive problem

Global corporations spend 20% of their annual OPEX powering data centers.

Data centers operate 24/7, massively consume energy, and are depleting our planet's resources at an accelerated and unsustainable rate. Smart VPUs require fewer servers. Less hardware consumes less power which reduces carbon emissions typically produced by a data centers.

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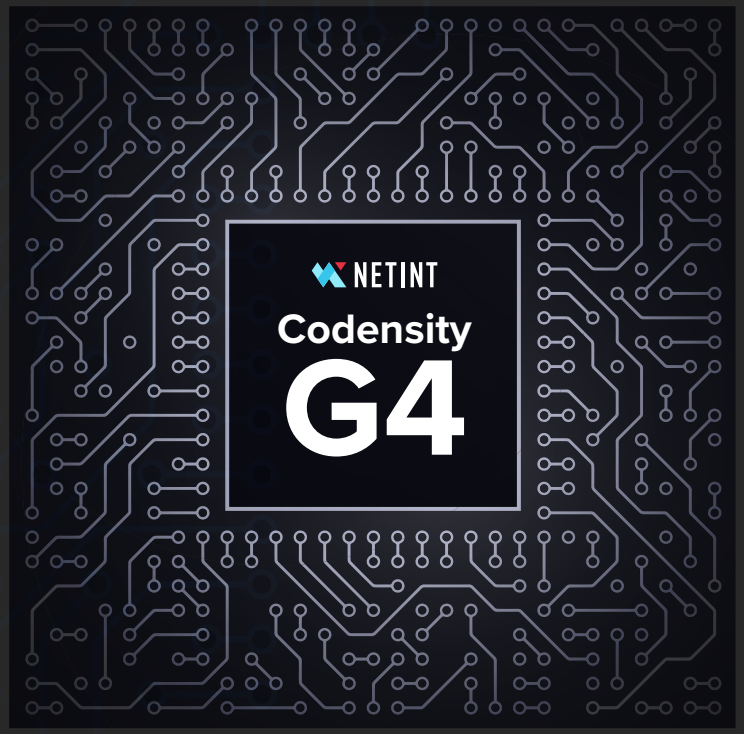
Our solution.



We designed an ASIC to slash the encoding footprint up to 80%

By replacing video encoding software with Smart VPUs (ASIC video processing units), you immediately get:

1. **Increased encoding capacity using fewer Smart VPU chips**
2. **Fewer chips require smaller hardware footprint**
3. **Less hardware consumes less power**

This chain of events saves your bottom line and the planet.

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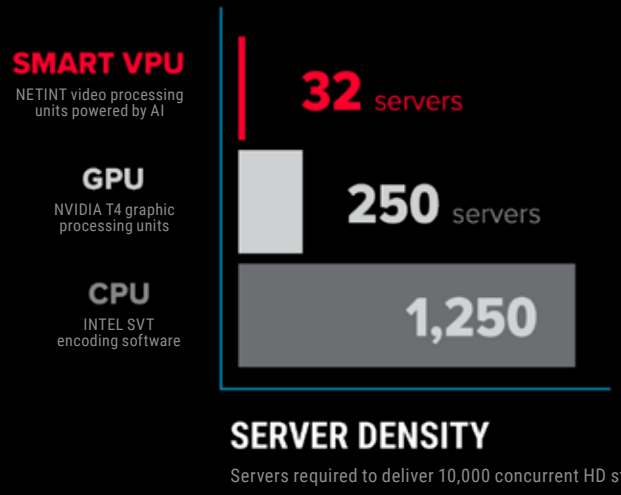
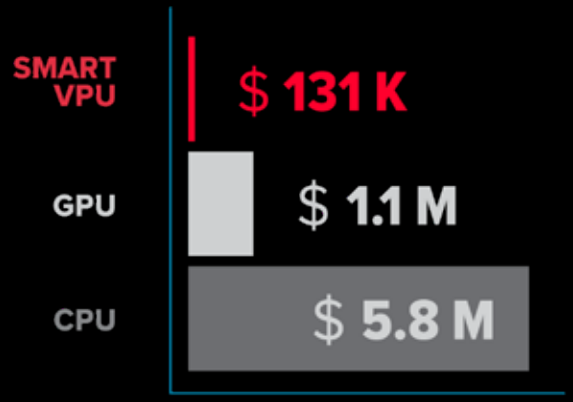


SERVER DENSITY

Servers required to deliver 10,000 concurrent HD streams



ANNUAL OPERATING COST

OPEX required to deliver 10,000 concurrent HD streams

This is why Google built a custom chip for YouTube

For everyone else who isn't Google, we did the heavy lifting for you.

We developed commercial-ready Smart VPU cards for easy drop-in replacement and immediate deployment.

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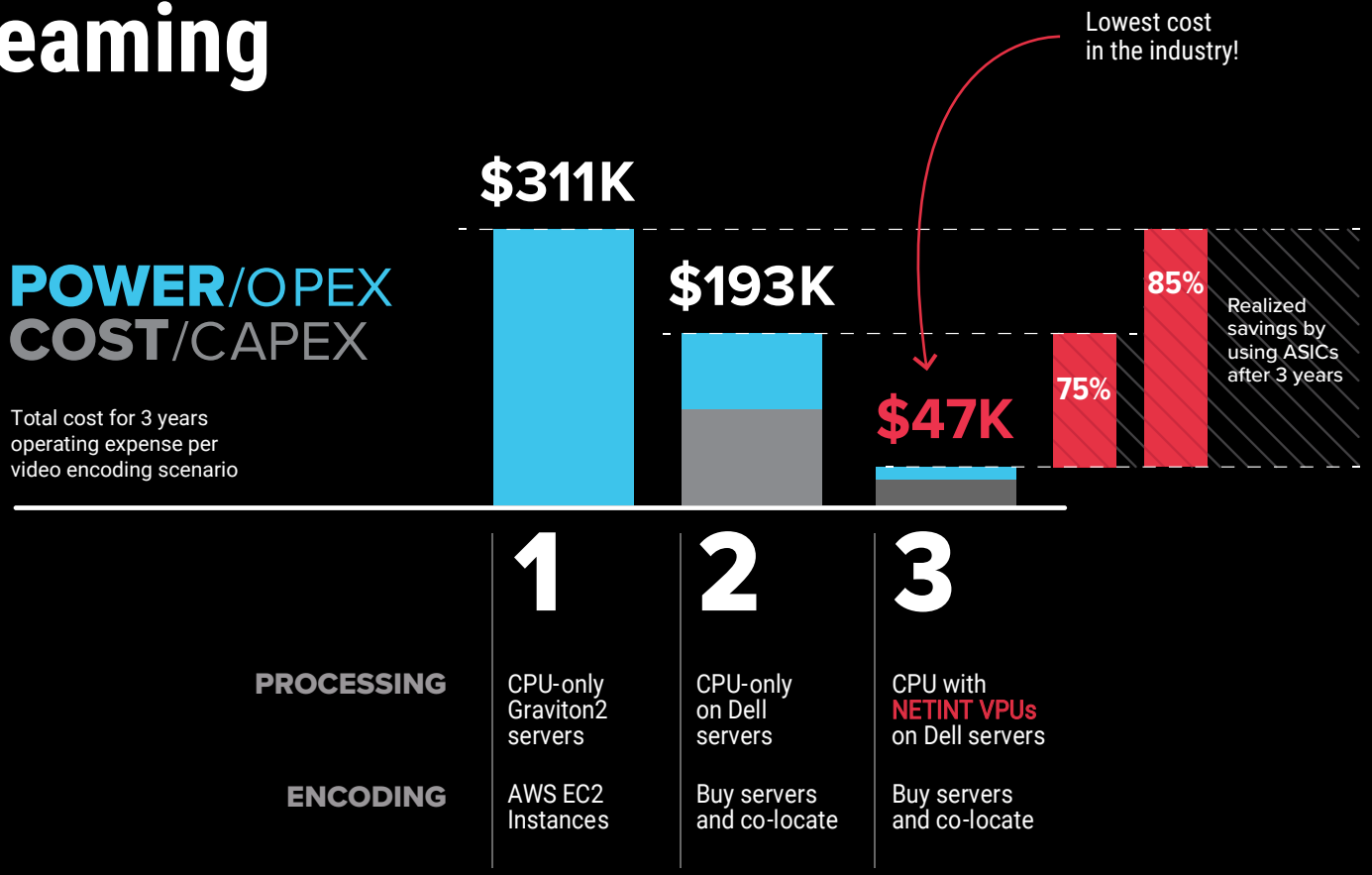
The real cost of live streaming



Test assumptions:

- Servers run 100 concurrent five-rung encoding ladders
- x264 very fast preset used for CPU-only processing

SOURCE: https://info.netint.com/hubfs/Whitepaper/Slash_CAPEX_OPEX_Carbon-Emissions-extended.pdf

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Logan
Video Server

VPU | **Codensity ASIC G4**

Ultra-high density encoding capacity

Built on the Supermicro 1114S-WN10RT server platform, server contains ten T408 VPUs.

- **HEVC and H.264 video encoding**
- **Up to 4K resolution**
- **10-bit HDR**

Ultra-low latency encoding of up to 80 broadcast quality 1080p30 streams in a compact 1RU form factor. Massive transcoding capacity enables breakthrough reductions of up to 80% in OPEX and CAPEX costs compared to software-based encoding systems.

Performance results in this brochure are for the NETINT Logan Video Server powered by an AMD EPYC™ 7543P (32-core) CPU. For encoding workflows with different encoding demands, the server is also available with the AMD EPYC 7232P (8-core) and 7713P (64-core) CPUs.

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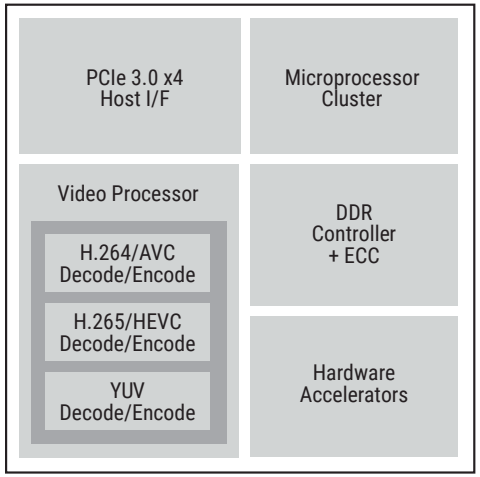
Codensity G4
ASIC VPU

ASIC Video Processing Unit

The Codensity G4 ASIC combines on-chip H.264 and HEVC video encoding, decoding, and processing engines which deliver scalability for video-intensive live streaming applications. The core of NETINT's Codensity technology is an in-house built ASIC that increases encoding density compared to CPU-based software encoding solutions.

This increase in encoding density expands the number of channels that can be encoded without increasing the rack footprint. Reduced power and HVAC cost means a lower TCO without sacrificing video quality or latency.



4K UHD Transcoding

On-chip H.264 and HEVC encoders and decoders deliver 4K live streaming scalability. Today, video is streamed using the ubiquitous H.264 standard while HEVC is a more complex codec. This limits the scalability of CPU and GPU-based encoders, which precipitously drop in throughput when encoding HEVC.

Not so for the Codensity G4 ASIC, which produces nearly identical throughput for both H.264 and HEVC. For both codecs, the Codensity G4 delivers the flexibility and quality of software with the performance of hardware for 4K live transcoding.

Flexible Architecture

The Codensity G4 is built on a programmable microprocessor architecture that optimizes firmware and pipeline processing and enables continual performance and quality improvements. This counters a criticism that silicon-based encoders lack upgrade flexibility.

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Designed for the Cloud

High-density live UHD Transcoding

The T408 video transcoder takes full advantage of the video processing capability inside the Codensity G4 ASIC to support H.264 and HEVC live encode and transcode functionality of 4K UHD video in SDR and HDR with HDR10 and other popular high dynamic range standards. By offloading complex encode and decode processing to the Codensity G4 ASIC, the T408 video transcoder minimizes host CPU utilization. The result is a significant improvement in real-time transcoding density compared to any software or GPU-based transcoding solution.

As many as ten software-based video encoding servers may be replaced for every NETINT Logan Video Server that is installed in the data center.

High power efficiency

Each NETINT T408 U.2 module consumes only 7W of power at full load. This makes the Logan Video Server the most energy efficient video transcoder available.

Enterprise NVMe Integration

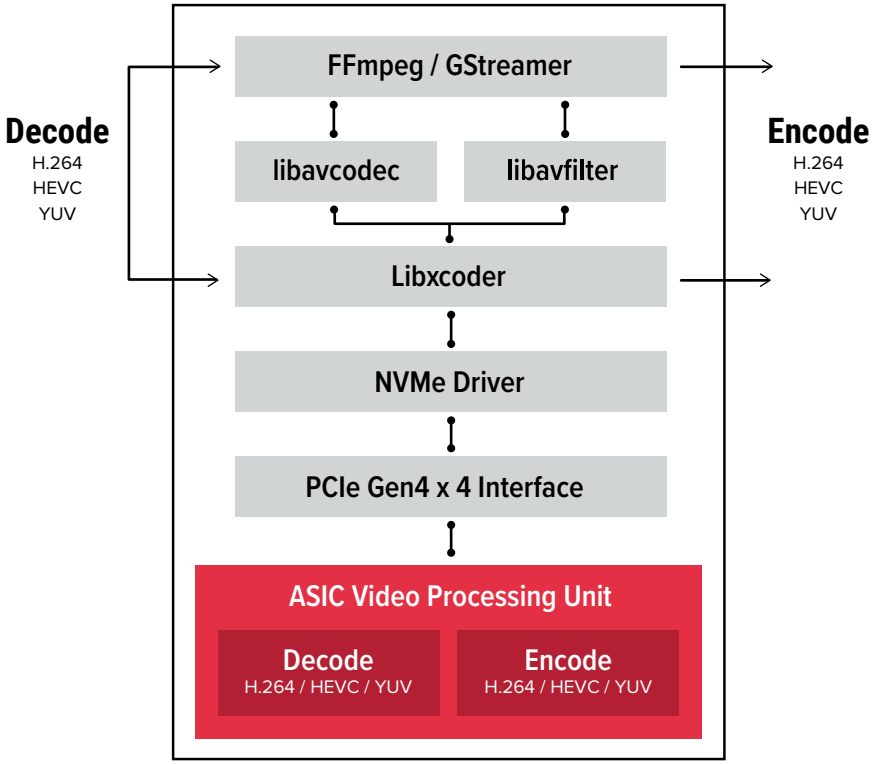
Available in the U.2 form factor, the T408 offers a simple upgrade path from CPU-based software to ASIC-powered video transcoding on any x86 or Arm-based server.

Simple Integration

Open-source suite of processing tools.

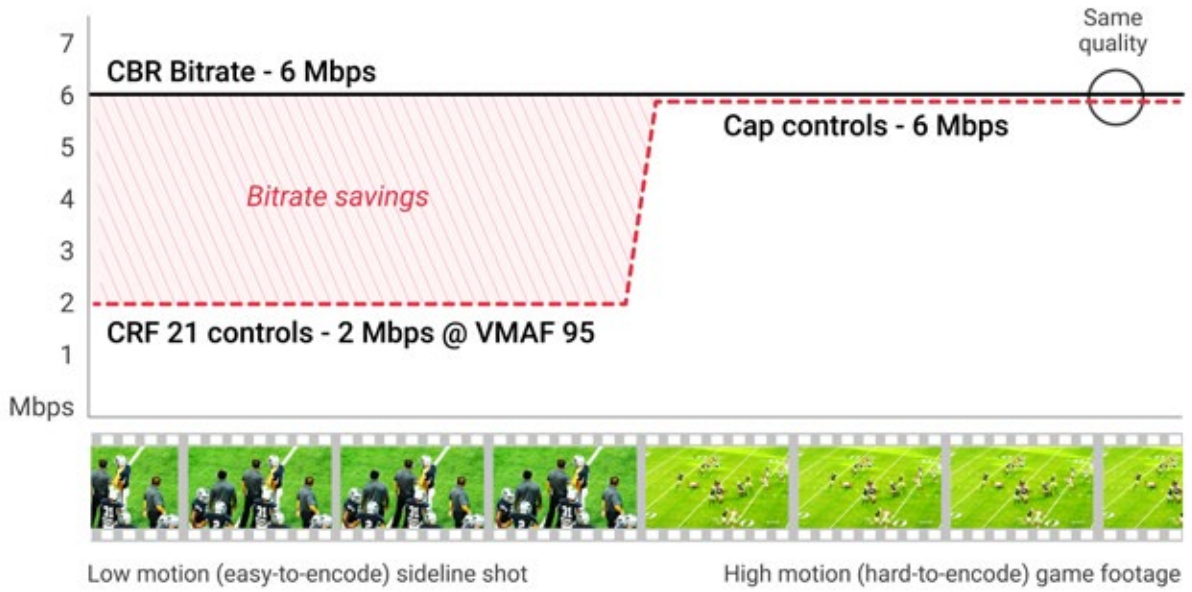
Many video processing and transcoding applications developers use FFmpeg and GStreamer, two open-source software libraries offering a vast suite of video processing functions. The T408 includes highly efficient FFmpeg and GStreamer compatible SDKs, allowing operators to apply a patch to complete the integration.

The libavcodec patch on the host server functions between the T408 NVMe interface and the FFmpeg and GStreamer software layers, simplifying integration and enabling fast and efficient performance and capacity upgrades.



Advanced Encoder Feature: Capped CRF

CRF 21 with a Cap of 6 Mbps versus 6 Mbps CBR



All Logan
VPU Products

Codensity Quadra G5

	1st Generation VPU		
	Modules		Server
	ASIC VPU **T408**	ASIC VPU **T432**	G4 VPU **Logan**
Performance			
ASIC Codensity chip	G4	G4 (4x)	G4, T408s (10x)
Price	$300	$1,200	starting at $7,000
Form Factor	U.2	AIC, HHHL	1RU Server
Power Consumption	7W	27W	~400W
Real-time Throughput Up to:	8x 1080p30 2x 4Kp30	32x 1080p30 8x 4Kp30	80x 1080p30 20x 4Kp30
Latency	12.8 ms	12.8 ms	12.8 ms
Encode Codecs	H.264, HEVC, YUV		
Decode Codecs	H.264, HEVC, YUV		
Audio Codecs	n/a		
Features			
Artificial Intelligence	n/a	n/a	n/a
New Capped CRF	●	●	●
Flexible GOP	●	●	●
Scaling	○	○	○
Cropping and Padding	○	○	○
Video Overlay	○	○	○
YUV / RGB Conversion	○	○	○
Configurable throughput	n/a	n/a	n/a

● Feature supported on VPU ○ Feature runs on host CPU

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VPU | Codensity ASIC G4

CPU Options	AMD EPYC™ 7232P Server Processor (8-core)
	AMD EPYC 7543P Server Processor (32-core)
	AMD EPYC 7713P Server Processor (64-core)
Operating System	Ubuntu 20.04.05 LTS
Memory	8x 16GB DDR4-3200
Storage	400GB M.2 SSD
NVMe Support	10x
PCIe Expansion	Up to 3x PCIe slots
Network Options	Dual 10GBase-T LAN
Power Consumption	~400W
Power Supply	700W: 100 - 140Vac
	750W: 200 - 240Vac
	750W: 200 - 240Vdc (CCC only)
Transcoders	10x NETINT T408
Throughput Capacity	Up to 80x 1080p30 or 20x 4Kp30
Codec Support	H.264 - Encode/Decode
	HEVC - Encode/Decode
	YUV - Encode/Decode
Software Integration	FFmpeg, GStreamer

Physical Dimensions	W: 17.2” (437mm), H: 1.7” (43mm), D: 23.5” (597mm)
Rack Size	1U
Weight	39 lbs (17.69 kg) *(fully loaded with 10 T408 VPUs)*
Environmental	50 degrees F to 95 degrees F Operating Temperature, 8% to 90% Operating Relative Humidity
Power Inputs	100 - 140Vac / 8 - 6V / 50-60Hz
	200 - 240Vac / 4.5 - 3.8A / 50-60Hz
	200 - 240Vdc / 4.5 - 3.8A (CCC Only)
Certifications	RoHS Compliant, UL Approved

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T408
VPU

Codensity ASIC G4

Form Factor	U.2 (SFF-8639)
Interface	PCIe 3.0 x4
Power Consumption (Typ)	7W
Usage	24/7 Operation
Operation Temperature	0 - 70°C
RoHS Compliance	Meets requirements of European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / HiP10 H.265 HEVC, Main / Main 10 YUV
Video Decoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / Hi10P H.265 HEVC, Main / Main 10 YUV
Throughput Capacity	8x 1080p30 or 2x 4Kp30
Level	1 to 6.2 Main Tier
Min / Max Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg and GStreamer SDKs and direct integration with LibXcoder API
Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
Closed Captioning	EIA CEA-708 for H.264 and H.265 encode/decode
High Dynamic Range (HDR)	HDR10 & HDR10+ for H.264 & H.265 encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure

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T432
VPU

Codensity ASIC G4

Form Factor	AIC (HHHL)
Interface	PCIe 3.0 x16 bifurcated to 4x4
Power Consumption (Typ)	27W
Usage	24/7 Operation
Operation Temperature	0 - 70°C
RoHS Compliance	Meets requirements of European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / HiP10 H.265 HEVC, Main / Main 10 YUV
Video Decoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / Hi10P H.265 HEVC, Main / Main 10 YUV
Throughput Capacity	32x 1080p30 or 8x 4Kp30
Level	1 to 6.2 Main Tier
Min / Max Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg and GStreamer SDKs and direct integration with LibXcoder API
Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
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Logan Video Server: Transcoding with Scaling

This table details the H.264 and HEVC output at the specified resolutions and frame rates; and the associated cost per stream. All inputs are scaled to the designated targets. Though the host CPU performs the scaling in these tests, **Note CPU utilization remains exceptionally low, reducing power costs and carbon emissions.**

Input	Output	Codec		FFmpeg	FFmpeg Low Delay	GStreamer	GStreamer Low Delay
4Kp30	1080p30	AVC > AVC	Instances	20	20	20	20
			CPU Usage	25.7	24.1	2.4	2.5
		AVC > HEVC	Instances	20	20	20	20
			CPU Usage	25.6	23.7	2.5	2.4
		HEVC > AVC	Instances	20	20	20	20
			CPU Usage	24.8	25.6	2.4	2.5
		HEVC > HEVC	Instances	20	20	20	20
			CPU Usage	24.2	25.2	2.4	2.6
1080p30	720p30	AVC > AVC	Instances	80	80	80	80
			CPU Usage	30.2	30.6	11.2	11.7
		AVC > HEVC	Instances	80	80	80	80
			CPU Usage	30.6	30.8	11.3	11.6
		HEVC > AVC	Instances	90	90	90	90
			CPU Usage	34.5	34.4	12.8	13.2
		HEVC > HEVC	Instances	90	90	90	90
			CPU Usage	35.4	35.1	12.8	13.1

Logan Video Server: Encoding Ladders

This table shows the number of full encoding ladders produced by the server and the cost per ladder for that output. Note the low CPU usage, despite all lower resolution rungs being scaled by the host CPU.

Input	Output	Codec		FFmpeg	FFmpeg Low Delay	GStreamer	GStreamer Low Delay
1080p30 - 5 Ladders	1080p30 @ 5Mbps	AVC > AVC	Instances	30	9	30	30
	1080p30 @ 3.5Mbps						
	720p30 @ 2Mbps		CPU Usage	31.6	8.7	7.8	8.8
	540p30 @ 1Mbps						
	360p30 @ 600kbps						
1080p30 - 4 Ladders	1080p30 @ 3.5Mbps	AVC > HEVC	Instances	26	14	28	28
	1080p30 @ 1.8Mbps						
	720p30 @ 1Mbps		CPU Usage	20.9	10.4	6.4	7.0
	360p @ 500kbps						
4Kp30 - 6 ladders	4Kp30 @ 12Mbps	AVC > HEVC	Instances	3	NA	7	7
	2Kp30 @ 7Mbps						
	1080p30 @ 3.5Mbps						
	1080p30 @ 1.8Mbps		CPU Usage	13.2		6.7	6.8
	720p30 @ 1Mbps						
	360p30 @ 500kbps						

Logan Video Server: Power Consumption

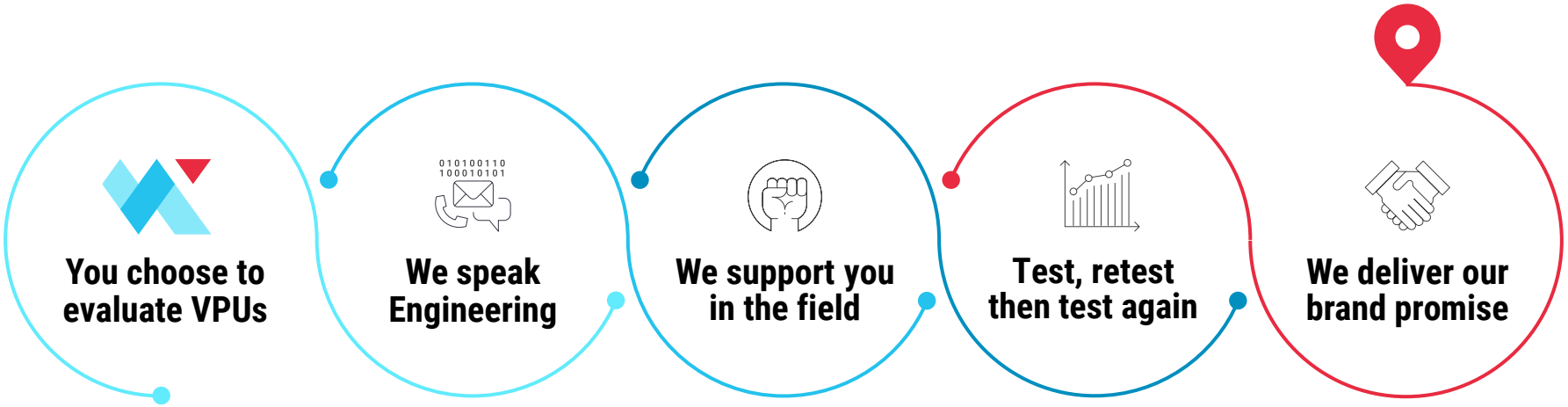
One of the key strengths of ASIC-based transcoders is ultra-low power consumption, which reduces OPEX and carbon emissions. You see this in the power figures, **particularly the Watts/Output, which are orders of magnitude lower than comparable figures for CPU-based transcoding.**

Operation	# Streams	Watts / Stream
Transcode 720p HEVC > HEVC, low delay	150	**2.1**
Scale 1080p > 720p HEVC to AVC, low delay	90	**3.4**
Five-rung AVC ladder, low delay	30	**10.8**

Your Buying Journey

What to expect when evaluating NETINT

We know the typical sales cycle prospective buyers endure is a 12-18 month process and we're prepared to stand beside you and navigate you through. We're demonstrating our committment to supporting you by heavily investing in this process so you can realize the value in our product and in working with us.



You chose wisely with Smart VPUs.

We speak your technical language and meet you where you are.

Our Field Engineers have boots in the trenches and exist solely for you.

Testing cycles require long term support, know we're committed to your successful implementation.

We promise your company will Hyperscale Profitably with Smart VPUs.

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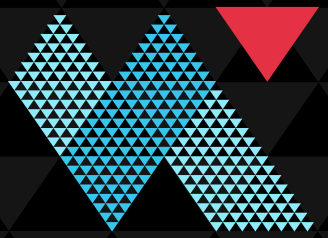

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HYPERSCALE PROFITABLY

For more information on NETINT encoding solutions, contact us.

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netint.com

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